Implementation of the European legislation to protect farm animals: a case-study on French inspections to find solutions to improve compliance

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Abstract

In the European Union at least 1% farms from are inspected every year and sanctions are applied to farms that do not comply with the legislation on animal welfare. These on-farm inspections can result in measures to correct welfare problems detected on farms. They can also highlight major risks that will require a focus of efforts and help prevent further non-compliances. Here we analysed the reports from inspections of French cattle farms between 2010 and 2013 to check whether inspection stimulates improvement and to propose ways to improve how animal welfare legislation is implemented through the cross-compliance system. French inspectors use 32 items to assess overall compliance of farms inspected. We found that compliance improves on farms that are re-inspected but not in other farms (8% of severely non-compliant farms). Nine items do not influence the overall assessment whereas eight items have a huge impact. The importance attributed to items varies from the 1st to the 2nd visit of a farm. The major risks are absence of farm records, lack of basic care (practices or enclosures likely to harm animals, insufficient feeding) and inadequate skills (no vet consulted, insufficient qualified staff). To improve compliance with EU animal welfare legislation and the efficiency of the inspection system, we suggest organising consultation between inspectors, ministry central services and welfare experts to (i) refine the checklist and harmonise interpretations of item compliance; (ii) make sure all farmers are aware of the legislative requirements and the major risks of non-compliance; and (iii) define plans for a stepwise improvement of non-compliant farms.

Keywords: animal welfare, cattle, compliance, EU legislation, inspections, overall assessment

Introduction

Remote risk of undernutrition, modification of the human–animal relationship, urbanization, intensification of farming conditions, progress in animal welfare science, and environmental degradation have made the use of farmed animals and ethical farming practices a focal issue (Broom1991; Miele *et al* 2011; Baratay 2012). These concerns emerged in the 1960s in the EU, where they remain prominent in European Commission Eurobarometers organised in 2005, 2007, 2015 (European Commission 2005, 2007, 2016), and are now seen as a worldwide issue (Kjærnes, Miele & Roex 2007; Bayvel *et al* 2012; You *et al* 2014).

The EU has addressed mounting citizen concern over the protection of farmed animals by lending increasing importance to animal welfare in primary law, moving it from a Protocol annexed to the Treaty of the Functioning of European Union (TFUE) to a specific article (Article 13) of the Treaty of Lisbon which entered into force in 2009. Article 13 clearly recognises animals as sentient beings. Numerous pieces of legislation (secondary law) have been adopted to regulate the practices concerning farm animals. In accordance with Council of Europe conventions and recommendations, EU Member States have adopted European directives and regulations on the protection of animals on farms in transport and at slaughter. In addition, the European Commission adopted two strategies on animal welfare, one covering the period 2006–2010 and the second covering 2012–2015, in which it stresses a policy to pursue efforts to stimulate improvements in animal welfare across Europe.

Despite this legislative arsenal from the European Union, the welfare of farm animals seems far from fully assured. Various media scandals initiated by non-governmental organisations specialised in animal protection have challenged public opinion on the effectiveness of the animal protection laws. Indeed, according to 2016 Eurobarometer figures, 82% of the 27,672 respondents believed that the welfare of farmed animals should be better protected than it is

today (European Commission 2016). The European Commission's effectiveness in putting Article 13 into practice is also under challenge from the European Parliament, which in 2015 adopted a resolution (i.e. a motion voted by all European parliamentarians) urging the European Commission to fully implement Article 13 and adopt a new strategy on animal welfare (European Parliament 2015). In its communication on the 2012–2015 strategy for animal welfare, the European Commission recognises that practical implementation of the legislation is not entirely satisfactory and that further legislation is useless without first properly enforcing the legislation already in place (European Commission 2012).

Since 2007, European farms are subject to cross-compliance on animal welfare (Kuhn G *et al* 2008). Member States are to inspect at least 1% of their farms, and any farmers who do not comply with minimum European requirements for animal welfare are to be sanctioned. Each year, Member States report to the Commission on the results of these inspections. This cross-compliance process can help improve the compliance of Member states in two ways. First, inspections serve to detect offences—on farms that are inspected—and can result in measures to correct these offences on the offender farms. Second, compliance monitoring can highlight major problems (in terms of seriousness and probability of occurrence in a population) that require a focus of efforts (raising awareness, proposing remedial solutions…) which, in turn, helps prevent non-compliance (Nitsch & Osterburg 2007).

Inspectors from the Food and Veterinary Office (FVO, an Office of the European Commission) monitor how Member States are implementing EU food policy. There are large variations in levels of farm compliance between EU Member States: on the broiler chickens directive for example, only 30% farms in France are compliant against 87% in Germany and 100% in Sweden, while on the directive concerning the protection of pigs, compliance rates range from 68% in the Netherlands and 70% in France to 95% in Sweden and 100% in Poland and Slovakia. The EUWelNet project comparing results from 11 Member States (France, Sweden, UK,

84 Germany, Netherlands, Italy, Spain, Romania, Slovakia and Poland) concluded that France
85 scores poorly on compliance with EU legislation to protect farm animals compared to the other
86 EU countries (Bock *et al* 2014).

87 Here we set out to understand the difficulties with effective implementation of EU legislation
88 to protect farm animals. We carried out a case study in France as it has apparent difficulties in
89 reaching high levels of compliance. We analysed the reports from inspections of cattle farms.
90 These inspections cover only cattle over 6 months of age. There is no specific national or
91 European legislation for the protection of these animals, therefore the inspections are carried
92 out under EC Directive 98/58 (European Commission 1998), which lays down general
93 principles related to the care of animals - whatever the species - stating that animals should
94 receive adequate quality and quantity of water and feed, be housed in appropriate settings,
95 receive due care, etc. As it does not set exact requirements (e.g. no precise quality or quantity
96 of feed or minimum space allowance per animal is specified), the directive leaves Member
97 States wide scope for interpretation. The checklist provided to inspectors to assess the
98 compliance of cattle farms in France uses similar general principles, thus also leaving inspectors
99 wide scope for interpretation. This wide scope for interpretation allowed us to investigate how
100 inspectors form a general judgement of the compliance of a farm. The specific objectives of
101 this study are 1) to check whether actual on-farm inspections are likely to stimulate
102 improvements in farm compliance with EU legislation to protect animals, and 2) to propose
103 ways to enable more efficient implementation of animal welfare legislation through the cross-
104 compliance system.

105

106 ## Material and Methods

107 ***Animal welfare controls in France***

In France, the controls for the protection of farm animals are supervised by the Ministry of Agriculture (**MoA**). Each year, at least 1% farms are inspected. With a population of 223000 cattle farms and 15.4 million cattle (excluding calves) on average per year between 2010 and 2013, these 1% represent 2230 farms and 15400 animals inspected each year (source: MoA, http://agreste.agriculture.gouv.fr/ and Interbev, http://www.interbev.fr). The inspectors are veterinarians or assistants from the local authority representing the MoA. The farms to be visited are chosen following a risk analysis, taking into account, for example, the results of previous animal welfare or health inspections, the size of the farm (large farms are more likely to be visited), the fact that a farm has been recently operating or large changes have been noticed (enlargement of the fam, new production), problems signalled by vets or complaints from citizens. The sample of farms to be inspected is completed by farms chosen at random to achieve 1% in each department. MoA central services have developed checklists to be used on-farm and guidelines to help inspectors use these checklists (some can be found at http://agriculture.gouv.fr/les-vade-mecum-dinspection). The checklist and guidelines are species-specific. The checklist related to inspections on animal welfare in the bovine sector was elaborated from EC Directive 98/58 on the protection of animals kept for farming purposes, as there is no specific legislation for the welfare of cattle. The checklist includes 32 items covering 6 areas: housing, equipment, staff, management, resources, and documentation (Table 1).

On a given farm, each of the 32 items are to be checked and the results are to be expressed as compliant, not compliant, not relevant, or not observed (if a specific problem means the item cannot be assessed). The guidelines give indications on how to assess the items and on what makes compliance or non-compliance for each item (e.g. when a farm is to be considered non-compliant for inappropriate housing, insufficient lighting, under-qualified staff, etc.). The guidelines also state cases where items will always be not relevant or always be compliant. Lighting cycle and intensity is only assessed when artificial lighting is used (implying that it is not relevant in the case of natural lighting). It is considered that cattle do not have predators and

133 so cattle farms will always be compliant with the item 'protection against adverse weather and
134 predators when outdoors'. Farms are considered compliant on the item 'farming practices
135 avoiding severe or lasting pain or harm' pending the determination of harmful practices and
136 their assessment by scientific experts. Furthermore, only painful mutilations (female castration
137 or dehorning) or administration of unsecure drugs at the time of the visit can lead to a non-
138 compliance with these two items, so the vast majority of farms are expected to be compliant.

139 After having checked all items, the inspector issues an overall assessment of the farm, which is
140 rated 'fully compliant', 'slightly non-compliant', 'moderately non-compliant', or 'severely
141 non-compliant'. The guidelines do not specify how the conclusion shall be drawn from the
142 evaluation of the 32 items, leaving it up to the inspector to judge the overall compliance of a
143 farm.

144 In most cases, farms that are rated severely non-compliant get visited a second time, unless they
145 get shut down soon after the first visit, in which case they cannot be re-visited.

146 After each inspection, the inspectors send a report of the farm's results (the 32 items and the
147 overall assessment) back to the MoA, which collects all such reports in a central database. For
148 the purposes of this study, the French MoA granted INRA access to the database.

149 ***Data collection and analyses***

150 We collated a total of 11 487 reports from inspections of French cattle farms between 2010 and
151 2013 and after discarding 141 reports where at least one item was not observed, a final total of
152 11 346 reports were analysed, corresponding to 9327 different farms visited once and 1155
153 farms re-visited twice or more.

154 All statistical analyses were performed using R software (R core team 2016). In order to avoid
155 dependencies between variables, we analysed all reports from first visits of farms (regardless

of whether farms would be visited only once or subsequently re-visited) and separately analysed all the reports from farms that were visited twice.

A χ^2 test was used to analyse the distribution of the overall assessment among farms visited once and its change over years. A χ^2 test was also used to analyse the distribution of non-compliances at item level in order to identify those items on which farms were more often non-compliant. For farms visited twice, a McNemar χ^2 test was used to compare the distribution of the overall assessment between the first and the second visit.

On first visits, a logistic regression was run to analyse the links between overall assessment and number of non-compliant items or non-compliances noted on specific items. To simplify the analyses, farms were classified as severely non-compliant vs. not severely non-compliant ('fully compliant', 'slightly non-compliant', and 'moderately non-compliant'). In a first analysis, the explanatory variable was the number of items with which the farm is not compliant. A second analysis used 32 explanatory variables corresponding to the level of compliance of the farm for each item; again, to simplify the analysis, per-item level of compliance was expressed as non-compliant vs. different to non-compliant (compliant or not relevant). The odds ratio (**OR**) obtained for an item measures the risk of a farm being declared severely non-compliant if it fails to comply with that item—in other words, the importance that inspectors lend to that item. Then, to highlight major instances of non-compliance, we multiplied the OR obtained for an item by the percentage of farms that were non-compliant on that item.

To analyse whether inspectors lend the same importance to an item in case of repeated visits, a similar logistic regression analysis was run separately on the first and the second visits. All items with a significant impact on the first or second visit were kept in the analysis.

180 # Results

181 ***Overall assessment: changes over years and visits***

182 At first visit, 60.6% of the farms were found fully compliant, 17.0% slightly non-compliant,
183 14.5% moderately non-compliant, and 7.91% severely non-compliant. These proportions did
184 not change over years from 2010 to 2013 ($\chi^2 = 0.63$, $P > 0.05$) (Figure 1).

185 When farms were visited twice, there were observable improvements from first to second visit:
186 4.8% fewer farms were found severely non-compliant on the second visit compared to the first
187 one. To estimate the size of the improvement, the four classes ('fully compliant', 'slightly non-
188 compliant', 'moderately non-compliant', or 'severely non-compliant') were transformed into
189 numbers (4, 3, 2, 1). A 0.23 improvement was observed from first to second visit (Mc Nemar's
190 $\chi^2 = 56.4$, $P < 0.001$), suggesting that a farm had a 23% chance of reaching the next best category
191 on the second visit (Figure 1).

192 ***Assessment at item level***

193 On the first visits, most items were fulfilled: 19 items were fulfilled on 80% of the farms and
194 11 items were fulfilled on 50 to 79% of the farms.

195 The non-compliances were not evenly distributed among items ($\chi^2 = 143{,}000$, $P < 0.001$) (Table
196 1). The items farms most often failed to comply with were: 'Farm records compliant with
197 legislation' (24.2% of farms), 'Protection against adverse weather and predators when
198 outdoors' (10.5% of farms), 'Equipment and building materials easy to clean and disinfect'
199 (7.66% of farms), 'Quantity and quality of feeding' (6.09% of farms), 'Quantity, quality and
200 frequency of watering' (5.9% of farms), 'Farming practices avoiding severe or long-lasting pain
201 or harm' (5.6% of farms), 'Feeding and watering devices designed to avoid contamination'
202 (5.4% of farms).

Some items were often considered not relevant, including the two items related to artificial ventilation ('Functioning of ventilation devices' and 'Functioning of the back-up ventilation system', not relevant in more than 95% of farms) and artificial lighting ('Intensity and cycle of lighting', 40% of farms).

Transition from checklisted items to overall assessment

Influence of number of item-level non-compliances on overall assessment

The number of items that a farm does not comply with had a significant impact on the overall assessment (logistic regression, OR = 1.81, $P < 0.001$). Half of farms that did not comply with 7 or more items were declared severely non-compliant, and farms counting more than 20 item-level non-compliances were (nearly) always considered severely non-compliant (Figure 2). However, there were variations around this general trend: for instance, one farm that failed to comply with 18 items was nevertheless considered fully compliant and one farm that failed to comply with 30 items was considered only moderately non-compliant (rather than severely non-compliant), whereas 86 farms that failed to comply with just one, 53 farms with only two or 54 farms with only three items were considered severely non-compliant (in most cases, these farms failed to comply with the 'Farm records compliant with legislation' item).

Items associated with overall assessment as 'severely non-compliant' (on 1st visit)

There were between-item variations in the impact of a non-compliance on a farm's overall assessment (logistic regression on first visits, Table 2). On first visits, 9 items had no impact on overall assessment: 'Protection against adverse weather and predators when outdoors', 'Equipment and building materials easy to clean and disinfect', 'Quality of ambient air (gases and dust)',' Functioning of ventilation devices (if artificial ventilation is used)',' Functioning of the back-up ventilation system and system alarms (if artificial ventilation is used)', 'Adequate staff numbers', 'Frequency of inspections of the animals', 'No mutilation (female castration or

227 dehorning after 4 weeks of age without anaesthesia)',' If in use, tethering systems allowing
228 basic behaviours'.

229 The items most often associated with an overall assessment as 'severely non-compliant' were:
230 'Farm records compliant with legislation', 'Consultation of a veterinarian when needed',
231 'Knowledges and qualifications [of staff]', 'Farming practices avoiding severe or long lasting
232 pain or harm', 'Outside enclosures well delimited', 'Frequency of feeding', 'Quantity and
233 quality of feeding', and 'Intensity and cycle of daily lighting (if artificial lighting is used)'. The
234 OR of these items was above 2, meaning that a farm that registers non-compliance on each of
235 these items is twice as likely to be found severely non-compliant than farms that comply with
236 these items.

237 *Changes in the importance of items when a farm is visited twice*
238 On farms visited twice, 13 items had a significant impact on the overall assessment on the first
239 or the second visit and were kept in the logistic regression. Their impact was not necessarily
240 the same on the two visits (Table 3).

241 The OR of four items increased from first to second visit: 'Feeding and watering devices
242 designed to avoiding contamination' (the OR increased by 273% at second visit compared to
243 first visit), 'Knowledge and qualifications' (+172%), 'Outside enclosures clear of harmful
244 objects such as metal or plastic scraps or disused machines' (+29 %), 'Quantity and quality of
245 feeding' (+ 26%).

246 The OR of four other items decreased from first to second visit: 'Safety of drugs administered
247 to animals (excluding prescriptions by a vet)' (-89%), 'Adequate functioning of feeding and
248 watering devices' (-56%), 'Prompt treatment of ill or injured animals' (- 49%), and
249 'Consultation of a veterinarian when needed' (-39%).

250 ***Identification of major risks***

The most critical risk by far was 'Farm records compliant with legislation' (OR of this item at first visit multiplied by percentage of farms that do not comply with this item = risk of 101). Then, the items 'Farming practices avoiding severe or long lasting pain or harm', 'Consultation of a veterinarian when needed', 'Quantity and quality of feeding', 'Outside enclosures clear of harmful objects such as metal or plastic scraps or disused machines', 'Knowledge and qualifications', 'Quantity, quality and frequency of watering' were associated to a risk between 10 and 20 (where 20 can correspond to an OR of 2 and 10% farms not complying).

Discussion

Our analysis of reports from official inspections of French farms between 2010 and 2013 found that a majority of farms were declared compliant with EU legislation to protect animals and that the proportion of fully-compliant farms increased when farms were re-inspected. This analysis also enabled us to gain insight on how inspectors concluded on whether a farm is or is not compliant, and to propose ways to make the inspection process more effective in terms of improving the level of compliance across farms.

First of all, this analysis of inspections performed in French cattle farms showed that 60.6% of farms were declared fully legislation-compliant when visited the first time, suggesting that these farms meet the basic standards for the welfare of their animals. In contrast, 7.9% of the farms were found severely non-compliant on first visit. In the bovine sector, the level of compliance is lower in France than in other EU Member States such as the UK (more than 80% of farms were fully compliant in 2004), Denmark (77% of farms fully compliant in 2010), and Finland (72% of farms fully compliant in 2013) (DEFRA 2005; Danish Center for Animal Welfare 2010; Finnish Center for Animal Welfare 2013). Our results corroborate previous findings from the EUWelNet project (see introduction) that France has apparent difficulties implementing

European legislation to protect animal welfare. The poorer results obtained by France might come from the fact that the farms to be inspected are essentially chosen from a risk analysis and this may not be the case in all countries.

When the farms were re-inspected, compliance improved: severe non-compliances were still found but at a lower frequency, while the proportion of fully-compliant farms increased. This improvement may result from a general trend in the farms population, due for instance to farmers being more concerned by the welfare of their animals or to wider societal pressure, or changes in farming models (Barkema *et al* 2015). However, no improvement was observed from 2010 to 2013 on farms visited once. Therefore, inspections *per se* are likely to have positive effect on the level of animal protection on French cattle farms. Inspections are liable to make farmers more aware of requirements in terms of animal protection. However, only 1% farms get inspected each year, and on average there was only a 23% chance that a farm would improve its compliance between two inspections. Therefore inspections-driven improvement remains very slow at population level. As suggested by Anneberg *et al* (2013), efforts to raise awareness of all farmers on legislative requirements could stimulate improvements more quickly than only inspecting farms.

Even though the French MoA provides precise guidelines on how to inspect farms, it seems that inspectors do not strictly follow them. For instance, the guidelines specify that 'Protection against adverse weather and predators when outdoors' is to be considered not relevant on all cattle farms, yet inspectors considered this item as compliant on 79% of farms and as not relevant in only 19% of farms. Likewise, the guidelines stipulate that farms shall always be found compliant in relation to 'Farming practices avoiding severe or long lasting pain or harm' (due to a lack of scientific evidence), yet 5% of farms were declared non-compliant on this item. The inspectors seem to use - at least to a degree - their own way to interpret what they see on farms before considering whether or not an item is fulfilled. This may be seen as a risk that

300 farm inspections may not be performed evenly between inspectors, as some inspectors may
301 follow the guidelines more strictly than others, but it could also be seen as a sign that inspectors
302 endorse the inspection process.

303 Based on Lipsky's theory of street-level bureaucracy (1980), the apparent discrepancy between
304 the rule and what is done in practice seems inevitable, as inspectors have to confront and deal
305 with the real-world cases of the farms they inspect. This is further emphasised by the fact that
306 the guidelines provided by the MoA do not make it clear how to form an assessment of the
307 overall compliance of a farm from the results obtained at item level. According to the reports
308 collated in the French national database, the more items a farm is found non-compliant with,
309 the more likely an inspector will judge it severely non-compliant. However, this seemingly
310 straightforward rule does have exceptions: some farms non-compliant on many items
311 nevertheless get declared fully compliant overall. Hence not only the quantity but also the
312 nature of the items for which a farm is non-compliant seems to play a role.

313 Out of the 32 items of the inspection checklist, 9 appear to not influence the assessment of the
314 overall compliance of a farm. Three concern the barn ventilation ('Quality of ambient air (gases
315 and dust)', 'Functioning of ventilation devices (if artificial ventilation is used)', 'Functioning
316 of the back-up ventilation system and system alarms (if artificial ventilation is used)'). Most
317 French cattle barns use natural air circulation via specific openings in the roof and walls, which
318 negates the need for mechanical ventilation and means inspectors can consider indoor air
319 quality as appropriate (even when high gas and dust concentrations are found in some farms).
320 'Protection against adverse weather or predators when animals are outdoors' also had no effect
321 on overall assessment, although 2.3% of the farms were non-compliant on this item. Inspectors
322 may consider that cattle can cope with such conditions without suffering. Similarly, inspectors
323 appear not to use 'Adequate staff numbers' and 'Frequency of inspections of the animals' (both
324 of which were noted in 2% of farms), 'If in use, tethering systems allowing basic behaviours'

(noted in 3% of farms), and 'Equipment and building materials easy to clean and disinfect' (noted in 7.67% of farms) when formulating their overall assessment. These items probably need to be re-discussed between inspectors, MoA central services, and experts in animal welfare in order to either refine their descriptions, define the importance inspectors are expected to attribute to a non-compliance in these areas, or even remove them if they are found to be irrelevant.

In contrast, some items have a huge impact on the assessment of the overall compliance of a farm. At first visits, the presence of farm records had the largest impact on inspectors' assessment of overall compliance, as farms that do not keep records have about four times more chance of being declared severely non-compliant overall. Farm records are written accounts of mortality, occurrence of diseases, frequency of veterinarian visits, and all medical treatments administered to animals. They were absent on nearly a quarter of the farms at first visit. Some farmers seem to disregard such paperwork, considering that it does not correspond to the normal work of the farmer which is more about caring for their animals than writing out accounts of what happens (Buller & Roe 2014; Escobar & Demeritt 2016). The readiness of the farmer to consult a veterinarian when needed and the farmer's own qualifications also have a big impact, again multiplying roughly fourfold the chances of the farm being declared severely non-compliant if they are not fulfilled. These two items relate to the skills necessary to taking good care of animals. Their impact on the overall assessment of compliance is in accordance with the importance attributed by both the EC and the French MoA to appropriate training (European Commission 2012; French Ministry of Agriculture 2016). Several items at least doubled the chances of a farm being declared severely non-compliant overall, and are related to the actual care that farmers provide their animals: practices avoiding pain or harm, outside enclosures clear of harmful objects, quantity, quality and frequency of feeding; and lighting of the barn. Other items were also found to negatively impact the overall assessment of the farm, albeit to

350 a lesser extent, and are related to farm equipment (equipment or building materials that might
351 be harmful, feeding and watering devices, daily check of equipment) or to the detection and
352 care of ill or injured animals. There thus seems to be a gradient in the conditions perceived by
353 inspectors as necessary to comply with the animal welfare legislation: from taking adequate
354 account of what is done on-farm (most importance attributed), to having the adequate skills to
355 protect animals, covering animals' basic requirements, and finally (least importance attributed
356 but still significant) limiting risks and providing adequate care to animals in poor health.

357 Surprisingly, some farms were declared severely non-compliant even though they failed to meet
358 very few items of the checklist. Inspectors therefore likely used other criteria in addition to
359 those of the checklist provided to them, at least on some farms.

360 The EFSA Panel on Animal Health and Welfare (AHAW) proposed to estimate the risks
361 associated to a welfare problem by considering the consequence of the problem together with
362 the exposure to the problem, i.e. probability to be affected (EFSA 2012). We transposed this
363 reasoning by multiplying the OR linked to a farm's non-compliance with a given item
364 (consequence of a non-compliance) by the proportion of farms that do not comply (exposure
365 assessment). The absence of farm records was both the most important item for inspectors and
366 the most frequent case of non-compliance, and is thus logically by far the highest risk. The next
367 highest risks correspond to items related to the care provided to animals by the farmer ('Farming
368 practices avoiding severe or long-lasting pain or harm', 'Consultation of a veterinarian when
369 needed', 'quantity and quality of feeding / watering', 'Outside enclosures clear of harmful
370 objects […]') and the skills of the farmer ('Knowledge and qualifications'). We propose that
371 inspection visits should lend special focus to these items to make the inspection process more
372 efficient. In addition, all farmers could be made aware of these risks of non-compliance
373 beforehand to ensure improvements across years on all farms, regardless of whether or not
374 farms are singled out for inspection.

375 The results presented above suggest that the inspection process would benefit from exchanges
376 between field inspectors, the ministry in charge of the inspections, and experts in animal welfare
377 in order to (i) refine the inspection checklist by removing less-relevant items and focusing
378 attention on those items that are considered especially relevant to on-farm animal protection
379 checks, and possibly adding new items, and (ii) editing the guidelines to include
380 recommendations on how formulate the assessment of overall compliance of a farm. During
381 the EUWelNet project, workshops and a web forum were organised to enable technical
382 personnel from the competent authorities of several Member States to exchange practices in
383 checking the compliance of farms with the EU directive to protect broilers (Manteca *et al* 2013).
384 The feedback from the staff that participated in this initiative was that it helped them identify
385 the best ways to check the directive-related requirements. Such exchanges should at least be
386 organised intra-Member State to help inspectors in their daily work.

387 Our analysis found that when farms were re-visited, the importance attributed by inspectors to
388 individual items changed from first to second visit. Some items that were important at first visit
389 became even more important at second visit. 'Quantity and quality of feeding' which already
390 had a large impact at first visit, was found to have even more impact on the overall assessment
391 of farm compliance at second visit. Indeed, supplying feed is one of the basics of livestock
392 farming and obviously essential to animals' lives. The farmer's 'Knowledge and qualifications'
393 was also found to have more impact at second visit. Farmers have the possibility to follow free
394 training sessions delivered by professional farmers' organisations, and the inspectors may
395 consider that a farmer that fails to follow a training session despite receiving a warning after
396 the inspection is a sign that this farmer is not willing to improve the situation. The 'Feeding and
397 watering devices designed to avoid contamination' item, which had little impact at first visit,
398 had a strong impact at second visit. Again, inspectors may consider that the farmer could have
399 easily improved the standard of cleanliness of their feeding and watering devices at no

400 additional cost. It therefore seems that at the second visit, inspectors lend more importance to
401 the feeding of the animals—an essential part of the care given by farmers to animals—and to
402 changes that farmers could have easily made after the first visit, i.e. his/her willingness to
403 improve the situation.

404 In contrast, some items were given less importance by inspectors at second visit, i.e. 'Safety of
405 drugs administered to animals (excluding prescriptions by a vet)', 'Consultation of a
406 veterinarian when needed', and 'Adequate functioning of the feeding and watering devices'.
407 The first two items do not relate to the everyday care that should be given to animals, while the
408 third may be inherent to the design of the building equipment and therefore difficult for farmers
409 to change in the time from first to second visit, which might explain why inspectors judge them
410 less crucial. However, inspectors would have to be interviewed to learn precisely how they
411 interpret these items.

412 The fact that inspectors change their way of reasoning from first to second visit of a farm
413 prompts us to posit that a way to increase the efficiency of the inspection process in terms of
414 improving farm compliance would be to issue farms declared severely non-compliant with a
415 progress plan. The first step could be to better educate farmers (training) to help assure the basic
416 needs of animals (feed and water) and correct what can be easily corrected (e.g. clean devices).
417 Then, expectations could be progressively levered to bring farms up to full compliance. This
418 kind of stepwise approach has already been recommended to improve the levels of farmed
419 animal health and welfare (Webster 2009; Tremetsberger & Winckler 2015). Indeed, effective
420 progresses can be made by setting realistic objectives and regularly checking progress, then
421 adjusting the plan according to results until reaching the ultimate goal of full compliance. In
422 addition to controlling farm compliance, a facilitating process could be put in place to
423 encourage farm improvement. The process could involve explaining the benefits of improving

424 the situation, helping farmers to analyse their situation, or stimulating exchanges between
425 farmers to analyse problems and propose solutions (Whay & Main 2015).

426 In conclusion, this study shows that the results of national inspections for the protection of farm
427 animals can be used to help Member States improve compliance to European legislation. More
428 specifically, we suggest taking steps to:

429 - make farmers aware of the requirements of the regulations and the major risks of non-
430 compliance. In the case of French cattle farms, these risks are: absence of farm
431 records, lack of basic care of animals (farming practices or untidy enclosures likely to
432 cause harm or pain, insufficient feeding), and inadequate skills (no vet consulted,
433 under-qualified staff).
434 - organise exchanges between ministry central services, field inspectors and animal
435 welfare experts to refine the checklist to be used by inspectors and help them better
436 interpret item compliance. After agreement is reached on the severity of dysfunctions
437 that may be detected on-farm, the inspections could be focused on what is viewed as a
438 severe offence to animal welfare or what corresponds to a high risk.
439 - define plans for a stepwise improvement of non-compliant farms. These plans should
440 take into account the severity of dysfunctions (as estimated via the earlier exchanges
441 between services) and the actual situation of a given farm.

442 In addition, more insight on inspector perceptions of the inspection method, e.g. through
443 interviews, is needed to confirm our findings here on the way inspectors perform inspections.
444 Likewise, interviews of farmers should help understand their knowledge and understanding of
445 the legislation, and identify the barriers to change and potential drivers to improve compliance
446 on EU legislation to protect farm animals.

447

Animal welfare implications

Compliance on legislation does not necessarily mean that animal welfare is fulfilled - indeed, the legislation contains only minimal requirements - but it is a pivotal basic step towards ensuring animal welfare. Compliance levels could be improved by taking action to raise farmers' awareness of major compliance and welfare problems, refining the checklist and guidelines provided to inspectors (typically via exchange of practice between field inspectors, ministry central services in charge of animal protection, and welfare experts), and proposing progress plans to farms that are struggling to comply with legislative requirements.

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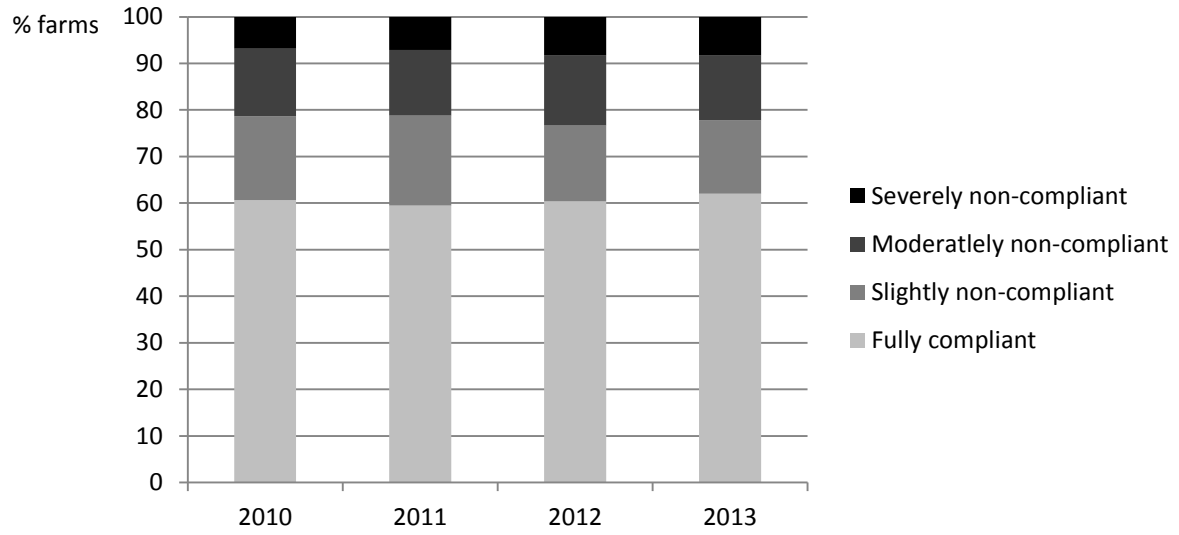
549 **Figure 1 Distribution of the overall assessment of the farms over years and between two**

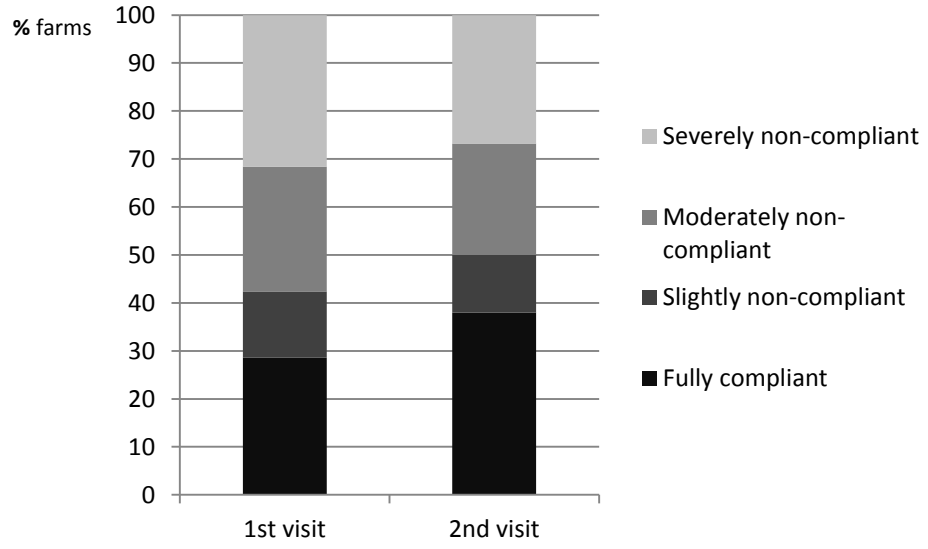
550 **consecutive visits**

551 **Figure 1a Trend over years at first visit (only farms visited once, n = 9327)**



552

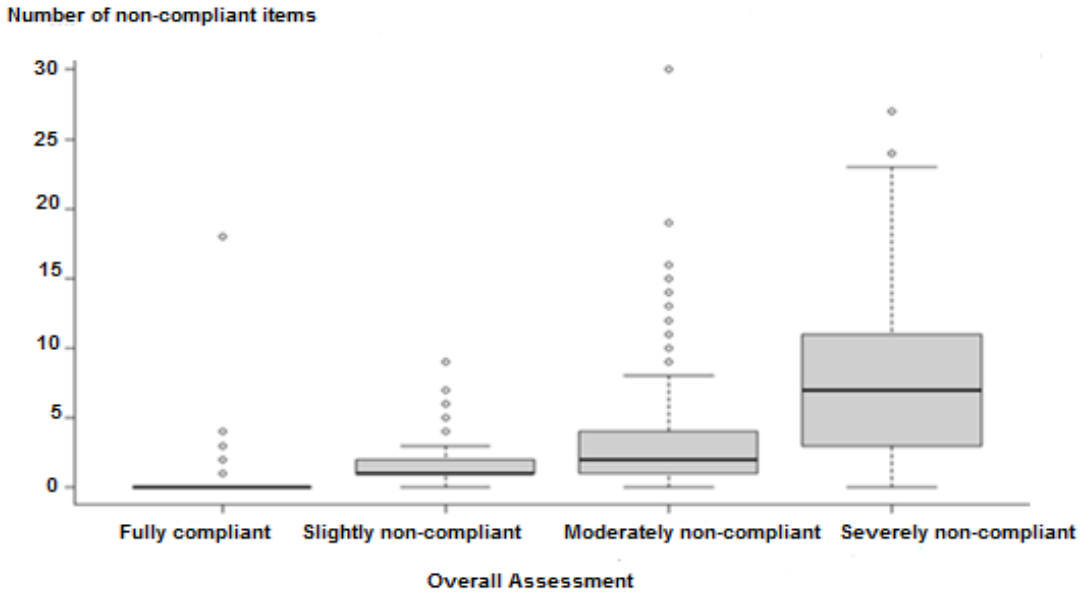
553 **Figure 1b Changes from first to second visit (only farms visited twice, n = 1155)**



554

555

Figure 2 Number of items counting non-compliances according to overall assessment of farm compliance (box plots)



562 **Table 1 Distribution of non-compliance among items. Only farms visited once are**

563 **included in the analysis (n = 9327).**

Area	Item	% Farms C[1]	NC[2]	NR[3]
Housing				
	Protection against adverse weather and predators when outdoors	78.70	2.30	19.00
	Outside enclosures clear of harmful objects such as metal or plastic scraps or disused machines	71.08	10.48	18.44
	Outside enclosures well delimited	76.87	3.64	19.49
	Building materials not harmful to animals	77.41	2.93	19.66
	Equipment and building materials easy to clean and disinfect	72.23	7.67	20.10
	No sharp edges likely to harm animals	76.45	3.37	20.18
	Soils allowing waste disposal	74.70	4.55	20.75
	Quality of ambient air (gases and dust)	80.91	1.66	17.43
	Temperature and humidity	79.58	1.30	19.12
	Intensity and cycle of daily lighting (if artificial lighting)	57.18	2.80	40.02
Equipment				
	Feeding and watering devices designed to avoid contamination	90.69	5.41	3.90
	Feeding and watering devices designed to avoid competition between animals	92.95	2.95	4.10
	Adequate functioning of feeding and watering devices	90.77	4.76	4.46
	Functioning of ventilation devices (if artificial ventilation is used)	4.33	0.02	95.65
	Functioning of the back-up ventilation system and system alarms (if artificial ventilation is used)	3.81	0.01	96.18
	Daily check of equipment	87.61	1.68	10.71
Staff				
	Knowledges and qualifications	95.39	3.09	1.53
	Adequate staff numbers	96.34	2.32	1.35
Management				
	Frequency of inspections of the animals	96.97	1.95	1.08
	Lighting suitable for animal inspections	83.99	0.88	15.13

	No mutilation (female castration or dehorning after 4 weeks of age without anaesthesia)	97.05	0.81	2.14
	Farming practices avoiding severe or long lasting pain or harm	93.34	5.59	1.08
	If in use, tethering systems allowing basic behaviours	90.36	3.03	6.61
	Prompt treatment of ill or injured animals	85.04	4.84	10.12
	No ill or injured animals left without proper care	88.25	4.58	7.17
	Isolation of ill or injured animals	82.85	4.49	12.67
	Consultation of a veterinarian when needed	87.82	4.25	7.92
Resources				
	Quantity and quality of feeding	93.00	6.09	0.91
	Frequency of feeding	95.63	3.16	1.21
	Quantity, quality and frequency of watering	93.66	5.79	0.56
	Safety of drugs administered to animals (excluding prescriptions by a vet)	78.77	1.38	19.85
Documentation				
	Farm records compliant with legislation	64.84	24.21	10.95

564 [1]Compliant: the farm is compliant for this item

565 [2]Non Compliant: the farm is non-compliant for this item

566 [3]Not Relevant: this item is not relevant on that farm.

Table 2 Impact of item-level compliances on the overall assessment of a farm (logistic regression). Only farms visited once are included in the analysis (n = 9327). Following a stepwise procedure, 9 items were not kept in the final model.

Area Item	OR[1]	P[2]	Risk[3]
Housing			
Protection against adverse weather and predators when outdoors	Not kept		
Outside enclosures clear of harmful objects such as metal or plastic scraps or disused machines	1.47	***	15.4
Outside enclosures well delimited	2.64	***	9.6
Building materials not harmful to animals	1.98	***	5.8
Equipment and building materials easy to clean and disinfect	Not kept		
No sharp edge likely to harm animals	1.69	***	5.7
Soils allowing waste disposal	1.65	***	7.5
Quality of ambient air (gases and dust)	Not kept		
Temperature and humidity	0.35	***	-
Intensity and cycle of daily lighting (if artificial lighting)	2.03	***	5.7
Equipment			
Feeding and watering devices designed to avoid contamination	1.35	***	7.3
Feeding and watering devices designed to avoid competition between animals	1.47	***	4.3
Adequate functioning of feeding and watering devices	1.82	***	9.3
Functioning of ventilation devices (if artificial ventilation is used)	Not kept		
Functioning of the back-up ventilation system and system alarms (if artificial ventilation is used)	Not kept		
Daily check of equipment	1.77	***	3.0
Staff			
Knowledges and qualifications	3.81	***	11.8
Adequate staff numbers	Not kept		
Management			
Frequency of inspections of the animals	Not kept		
Lighting suitable for animal inspections	1.73	NS	-
No mutilation (female castration or dehorning after 4 weeks of age without anaesthesia)	Not kept		

Farming practices avoiding severe or long lasting pain or harm	3.06	***	17.1
If in use, tethering systems allowing basic behaviours	Not kept		
Prompt treatment of ill or injured animals	1.78	***	8.6
No ill or injured animals left without proper care	1.78	***	8.2
Isolation of ill or injured animals	1.68	***	7.5
Consultation of a veterinarian when needed	3.91	***	16.6
Resources			
Quantity and quality of feeding	2.54	***	15.5
Frequency of feeding	2.6	***	8.2
Quantity, quality and frequency of watering	1.82	***	10.5
Safety of drugs administered to animals (excluding prescriptions by a vet)	0.48	NS	-
Documentation			
Farm records compliant with legislation	4.17	***	101.0

[1] Odds ratio

[2] Probability. ***, $P < 0.001$; NS, not significant.

[3] Risk = OR × % farms non-compliant at first visit (from Table 1). Calculated only when the OR is significant.

Table 3. Impact of item-level compliances on the overall assessment of a farm when visited for the first *vs* second time (logistic regressions). Only farms visited twice are included in the analysis (n = 1155). Only 13 items were significant on first or second visit and were kept in the final models.

Area	Visit 1		Visit 2	
Item	**OR[1]**	**P[2]**	**OR**	**P**
Housing				
Outside enclosures clear of harmful objects such as metal or plastic scraps or disused machines	2.05	***	2.64	***
Soils allowing waste disposal	1.55	***	1.46	NS
Temperature and humidity	2.33	***	1.41	NS
Equipment				
Feeding and watering devices designed to avoid contamination	0.63	***	2.35	**
Adequate functioning of feeding and watering devices	2.13	***	0.93	*
Staff				
Knowledges and qualifications	2.15	***	0.85	**
Management				
Farming practices avoiding severe or long lasting pain or harm	1.98	***	2.25	***
Prompt treatment of ill or injured animals	3.87	***	1.98	***
Isolation of ill or injured animals	2.40	***	2.00	***
Consultation of a veterinarian when needed	3.89	***	2.47	***
Resources				
Quantity and quality of feeding	4.07	***	5.13	***
Safety of drugs administered to animals (excluding prescriptions by a vet)	2.81	***	0.23	NS
Documentation				
Farm records compliant with legislation	2.40	***	2.00	***

[1] Odds ratio

[2] Probability. ***, $P < 0.001$; NS, not significant